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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
THANGAVELU, KANDASAMY	

ART UNIT	PAPER NUMBER
2123	

DATE MAILED: 07/15/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/268,999	ARITA, YUICHI	
	Examiner	Art Unit	
	Kandasamy Thangavelu	2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 March 2004 and 11 May 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 February 2003* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *11 May 2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Introduction

1. This communication is in response to the Applicant's Amendments, mailed on March 12, 2004 and May 11, 2004. Claims 1, 9, 13, 22 and 27 were amended. Claims 1-29 are pending. This office action is made non-final in response to the applicant's request for continued examination

Response to Arguments

2. Applicant's arguments filed on March 12, 2004 and May 11, 2004 with respect to claim rejections under 35 U.S.C. 112 first paragraph and 35 U.S.C. 112 second paragraph have been fully considered. The claim rejections under 35 U.S.C. 112 first paragraph and second paragraph are withdrawn in response to the applicant's amendment dated March 12, 2004. Additional claim rejections under 35 U.S.C. 103 (a) are included in this office action. Examiner's response to the applicant's arguments are presented in Paragraph 12 below.

Claim Objections

3. The following is a quotation of 37 C.F.R § 1.75 (d)(1):

> The claim or claims must conform to the invention as set forth in the remainder of the specification and terms and phrases in the claims must find clear support or antecedent basis in

the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.

4. Claims 23, 24 and 29 are objected to because of the following informalities:

In amendment dated March 12, 2004, Claim 23, Para 3, "on an automatic determination during the simulation that it satisfies an ideal working condition of the working means model" appears to be incorrect and appears that it should be "on an automatic determination during the simulation that it satisfies a working condition of the working means model".

In amendment dated March 12, 2004, Claim 24, Para 5, "a processing unit automatically determining whether or an extent to which the arranged working model can work the component model" appears to be incorrect and appears that it should be "a processing unit automatically determining whether or an extent to which the arranged working means model can work the standard part model".

In amendment dated March 12, 2004, Claim 24, Para 5, "based on an automatic determination during the simulation that it satisfies an ideal working condition of the working means model" appears to be incorrect and appears that it should be "based on an automatic determination during the simulation that it satisfies a working condition of the working means model".

In amendment dated March 12, 2004, Claim 29, "where the simulating is done with reference to an ideal working condition of each particular working means model" appears to be incorrect and appears that it should be "where the simulating is done with reference to a working condition of each particular working means model".

Appropriate corrections are requested.

Claim Interpretations

5. The claims are interpreted using the following interpretations of the claim language:

In amendment dated March 12, 2004, Claim 23, Para 3, "on an automatic determination during the simulation that it satisfies an ideal working condition of the working means model" is interpreted as "on an automatic determination during the simulation that it satisfies a working condition of the working means model".

In amendment dated March 12, 2004, Claim 24, Para 5, "a processing unit automatically determining whether or an extent to which the arranged working model can work the component model" is interpreted as "a processing unit automatically determining whether or an extent to which the arranged working means model can work the standard part model".

In amendment dated March 12, 2004, Claim 24, Para 5, "based on an automatic determination during the simulation that it satisfies an ideal working condition of the working means model" is interpreted as "based on an automatic determination during the simulation that it satisfies a working condition of the working means model".

In amendment dated March 12, 2004, Claim 29, "where the simulating is done with reference to an ideal working condition of each particular working means model" is

interpreted as "where the simulating is done with reference to a working condition of each particular working means model".

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

7. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 1-5, 7, 8, 9, 12-18, 21-24, 27 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Siddique** (Thesis to The Academic faculty for Master of Science in Mechanical Engineering, Georgia Institute of Technology, May 1996) in view of **Goto et al.** (U.S. Patent 5,075,866) and further in view of **Hirai et al.** (U.S. Patent 5,815,400).

8.1 **Siddique** teaches Conversion of CAD model data for virtual prototypes for disassembly. Specifically, as per Claim 1, **Siddique** teaches a simulation apparatus for simulating based on design information of a design model designed in a virtual three-dimensional space (Fig. 6.6; Page 122, Sec. 6.2.3);

working of a working means model to be used for the one or more standard part models arranged in the design model (Fig. 6.6; Page 122, Sec. 6.2.3); comprising:

a working means model information storage section for storing working means model information which indicates details of the working means model to be used in working on the one or more standard part models (Page 117- Page120, Para 2); the working means model information being linked with standard part model information which indicates details of the one or more standard part models (Page 128, Fig. 6.9);

a working means model information extraction section for automatically referring, based on information regarding the standard part models arranged in a design model, to the working means model information storage section to extract information regarding a working means model to be used to work the standard part models arranged in the design model (Page 128, Fig. 6.9; Page 130, Fig. 6.11); and

a working simulation execution section for executing a simulation of the working of the standard part models with the working means model based on design information of the design model and the information regarding the working means model extracted by the working means model information extraction section (Fig. 6.6; Page 122, Sec. 6.2.3).

Siddique does not expressly teach that one or more standard part models standardized in advance based on a specification model are arranged in the design model. **Goto et al.** teaches

that one or more standard part models standardized in advance based on a specification model are arranged in the design model (Fig.2; Fig. 14; Col 4, Lines 24-28; and Col 4, Lines 37-49), as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus (Col 1, Lines 11-15). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the simulation apparatus of **Siddique** with the CAD automatic design apparatus of **Goto et al.** that included one or more standard part models standardized in advance based on a specification model arranged in the design model, as standard parts were commercially available and widely used and their models were readily available in the CAD automatic design apparatus.

Siddique teaches plural working means models preassociated with the standard part models based on the simulation that it satisfies a working condition of the working means model (Page 117, Para 2, Lines 6-10; Page 118, Sec. 6.2.2; Page 119, Para 1; Fig. 6.6; Page 122, Sec. 6.2.3). **Siddique** does not expressly teach that the working means model is automatically selected from among plural other working means models preassociated with the standard part models based on an automatic determination during the simulation that it satisfies a working condition of the working means model. **Hirai et al.** teaches that the working means model (tool) is automatically selected from among plural other working means models (tools) preassociated with the standard part models (specific component) based on an automatic determination during the simulation that it satisfies a working condition (cutting conditions) of the working means model (Abstract, Lines1-9; Col 4, Lines 44-50; Col 5, Lines 44-60; Col 52, Lines 35-37 and 65-67; Col 53, Lines 1-3), as that would allow selecting tools taking into account various factors; for machining operations these would be material to be removed,

machining accuracy and machining (Col 1, Lines 19-20). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the simulation apparatus of **Siddique** with the CAD automatic design apparatus of **Hirai et al.** that included the working means model being automatically selected from among plural other working means models preassociated with the standard part models based on an automatic determination during the simulation that it satisfies a working condition of the working means model, as that would allow selecting tools taking into account various factors; for machining operations these would be material to be removed, machining accuracy and machining.

8.2 As per Claim 2, **Siddique, Goto et al.** and **Hirai et al.** teach the simulation apparatus of Claim 1. **Siddique** also teaches that the information regarding the standard part models arranged in the design model include attribute information of the working means model related to the standard part models, and the working means model information extraction section refers to the working means model information storage section based on the attribute information to extract the information regarding the working means model (Page 128, Fig. 6.9; Page 130, Fig. 6.11).

8.3 As per Claim 3, **Siddique, Goto et al.** and **Hirai et al.** teach the simulation apparatus of Claim 1. **Siddique** also teaches that the working means model information storage section stores information of one or more tool models which are models of actual tools and/or a hand model which is a model of a hand of a worker as the information regarding the working means model (Page 117- Page120, Para 2).

8.4 As per Claim 4, **Siddique, Goto et al.** and **Hirai et al.** teach the simulation apparatus of Claim 1. **Siddique** also teaches that the information regarding the working means model stored in the working means model information storage section includes reference position information of the working means model when the working means model works the standard part models (Page 117, Para 2; Page 118, Para 2; Page 119 and 120); and

the working simulation execution section performs a simulation of a relationship in position/posture of the working means model to the standard part models based on the reference position information of the working means model and the standard part models (Fig. 6.6; Page 122, Sec. 6.2.3).

Siddique does not expressly teach that the design information of the design model includes reference position information of the standard part models when the working means model works the standard part models. **Goto et al.** teaches the design information of the design model includes reference position information of the standard part models when the working means model works the standard part models (Fig. 16D, S144; Col 5, Lines 17-27; Col 5, Lines 29-32; Col 5, Lines 34-36), as the linkage model contains the relationship between the design model and the standard parts (Col 5, Lines 19-27). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the simulation apparatus of **Siddique** with the simulation apparatus of **Goto et al.** that included the design information of the design model including reference position information of the standard part models when the working means model works the standard part models, as the linkage model would contain the relationship between the design model and the standard parts.

8.5 As per Claim 5, **Siddique, Goto et al.** and **Hirai et al.** teach the simulation apparatus of Claim 1. **Siddique** also teaches the simulation apparatus comprising an interference checking section for checking interference of the working means model (Page 123, Sec. 6.2.4; Page 124, Fig. 6.7 and Para 2) while the working simulation execution section executes a simulation of the working of standard part models with the working means model (Page 122, Fig. 6.6).

6.6 As per Claim 7, **Siddique, Goto et al.** and **Hirai et al.** teach the simulation apparatus of Claim 2. **Siddique** also teaches the simulation apparatus comprising a workability evaluation section for evaluating workability based on a result of execution of the working simulation by the working simulation execution section and also based on information of the attribute of the working means model, where the workability indicates whether or an extent to which the working means model is able to work the one or more standard part models (Page 122, Section 6.2.3).

8.7 As per Claim 8, **Siddique, Goto et al.** and **Hirai et al.** teach the simulation apparatus of Claim 2. **Siddique** also teaches that the working means model information storage section stores information regarding a working condition necessary for working of the working means model as information regarding the working means model (Page 117, Para 2, Lines 6-10; Page 118, Sec. 6.2.2; Page 119, Para 1); and

the working simulation execution section executes a working simulation based on the information regarding the working condition of the corresponding working means model stored in the working means model information storage section (Page 120, Para 2 & 3).

8.8 As per Claim 9, **Siddique** teaches a simulation apparatus for simulating based on design information of a design model designed in a virtual three-dimensional space (Fig. 6.6; Page 122, Sec. 6.2.3);

working for the standard part models arranged in the design model (Fig. 6.6; Page 122, Sec. 6.2.3); comprising:

a working means model information storage section for storing working means model information which indicates details of the working means model to be used in working on the one or more standard part models (Page 117- Page120, Para 2); the working means model information being linked before simulating of the apparatus with standard part model information which indicates details of the one or more standard part models (Page 128, Fig. 6.9);

a working means model information extraction section for automatically referring, based on information regarding the standard part models arranged in a design model, to the working means model information storage section to extract information regarding a working means model to be used to work the standard part models arranged in the design model (Page 128, Fig. 6.9; Page 130, Fig. 6.11);

a working simulation execution section for executing a simulation of the working of the standard part models with the working means model based on design information of the design model and the information regarding the working means model extracted by the working means model information extraction section (Fig. 6.6; Page 122, Sec. 6.2.3);

the working means model information storage section stores information regarding a working condition necessary for working of the working means model as information regarding

the working means model (Page 117, Para 2, Lines 6-10; Page 118, Sec. 6.2.2; Page 119, Para 1);

the working simulation execution section executes a working simulation based on the information regarding the working condition of the corresponding working means model stored in the working means model information storage section (Page 120, Para 2 & 3); and

the working means model information storage section stores information regarding working spaces necessary for working with the working means model as the information regarding the working conditions of the individual working means model (Fig. 6.6; Page 122, Sec. 6.2.3); the simulation computes the accessibility and relative difficulty of fastening using the working spaces information.

Siddique does not expressly teach that one or more standard part models standardized in advance based on a specification model are arranged in the design model. **Goto et al.** teaches that one or more standard part models standardized in advance based on a specification model are arranged in the design model (Fig.2; Fig. 14; Col 4, Lines 24-28; and Col 4, Lines 37-49), as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus (Col 1, Lines 11-15). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the simulation apparatus of **Siddique** with the CAD automatic design apparatus of **Goto et al.** that included one or more standard part models standardized in advance based on a specification model arranged in the design model, as standard parts were commercially available and widely used and their models were readily available in the CAD automatic design apparatus.

Siddique teaches plural working means models preassociated with the standard part models based on the simulation that it satisfies a working condition of the working means model (Page 117, Para 2, Lines 6-10; Page 118, Sec. 6.2.2; Page 119, Para 1; Fig. 6.6; Page 122, Sec. 6.2.3). **Siddique** does not expressly teach that the working means model is automatically selected from among plural other working means models preassociated with the standard part models based on an automatic determination during the simulation that it satisfies a working condition of the working means model. **Hirai et al.** teaches that the working means model (tool) is automatically selected from among plural other working means models (tools) preassociated with the standard part models (specific component) based on an automatic determination during the simulation that it satisfies a working condition (cutting conditions) of the working means model (Abstract, Lines1-9; Col 4, Lines 44-50; Col 5, Lines 44-60; Col 52, Lines 35-37 and 65-67; Col 53, Lines 1-3), as that would allow selecting tools taking into account various factors; for machining operations these would be material to be removed, machining accuracy and machining (Col 1, Lines 19-20). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the simulation apparatus of **Siddique** with the CAD automatic design apparatus of **Hirai et al.** that included the working means model being automatically selected from among plural other working means models preassociated with the standard part models based on an automatic determination during the simulation that it satisfies a working condition of the working means model, as that would allow selecting tools taking into account various factors; for machining operations these would be material to be removed, machining accuracy and machining.

8.9 As per Claim 12, **Siddique, Goto et al.** and **Hirai et al.** teach the simulation apparatus of Claim 1. **Siddique** does not expressly teach that at least one of a fastening part model, an adjustment part model and a connector part model is used for the standard part models. **Goto et al.** teaches that at least one of a fastening part model, an adjustment part model and a connector part model is used for the standard part models (Fig.6A; Fig. 6B; Col 6, Lines 35-42), as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus (Col 1, Lines 11-15). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the simulation apparatus of **Siddique** with the CAD automatic design apparatus of **Goto et al.** that included at least one of a fastening part model, an adjustment part model and a connector part model used for the standard part models, as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus.

8.10 As per Claim 13, **Siddique** teaches a simulation method for simulating, based on data regarding a design model displayed in a virtual three-dimensional space and designed (Fig. 6.6; Page 122, Sec. 6.2.3); and

a simulation method for simulating workability according to a working means model used to work the standard part models arranged in the design model (Fig. 6.6; Page 122, Sec. 6.2.3); comprising:

providing working means model information, which indicates details of a working means model to be used in working on the one or more standard part models (Page 117- Page120, Para 2);

the working means model information being linked before simulating of the method with standard part model information (Page 128, Fig. 6.9);

automatically acquiring the working means model, which is to be used in working on the individual standard part model, based on the working means model information linked with the standard part model information that indicates the details of the last-named individual standard part model (Page 128, Fig. 6.9; Page 130, Fig. 6.11); and

executing a simulation of working to be performed for the standard part models using the acquired working means model and displaying a process of the execution of the simulation in a virtual three-dimensional space (Fig. 6.6; Page 122, Sec. 6.2.3).

Siddique does not expressly teach the method comprising one or more standard part models standardized in advance based on a specification model arranged in the design model and providing standard part model information, which indicates details of the one or more standard part models. **Goto et al.** teaches the method comprising one or more standard part models standardized in advance based on a specification model are arranged in the design model and providing standard part model information, which indicates details of the one or more standard part models (Fig.2; Fig. 14; Col 4, Lines 24-28 and Col 4, Lines 37-49), as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus (Col 1, Lines 11-15). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the simulation method of **Siddique** with the CAD automatic design method of **Goto et al.** that included the method comprising one or more standard part models standardized in advance based on a specification model arranged in the design model and providing standard part model information, which indicates details of the

one or more standard part models, as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus.

Siddique teaches plural working means models preassociated with the standard part models based on the simulation that it satisfies a working condition of the working means model (Page 117, Para 2, Lines 6-10; Page 118, Sec. 6.2.2; Page 119, Para 1; Fig. 6.6; Page 122, Sec. 6.2.3). **Siddique** does not expressly teach that the working means model is automatically selected from among plural other working means models preassociated with the standard part models based on an automatic determination during the simulation that it satisfies a working condition of the working means model. **Hirai et al.** teaches that the working means model (tool) is automatically selected from among plural other working means models (tools) preassociated with the standard part models (specific component) based on an automatic determination during the simulation that it satisfies a working condition (cutting conditions) of the working means model (Abstract, Lines1-9; Col 4, Lines 44-50; Col 5, Lines 44-60; Col 52, Lines 35-37 and 65-67; Col 53, Lines 1-3), as that would allow selecting tools taking into account various factors; for machining operations these would be material to be removed, machining accuracy and machining (Col 1, Lines 19-20). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Siddique** with the method of **Hirai et al.** that included the working means model being automatically selected from among plural other working means models preassociated with the standard part models based on an automatic determination during the simulation that it satisfies a working condition of the working means model, as that would allow selecting tools taking into account

various factors; for machining operations these would be material to be removed, machining accuracy and machining.

8.11 As per Claim 14, **Siddique, Goto et al.** and **Hirai et al.** teach the simulation method of Claim 13. **Siddique** also teaches that as the simulation of the working to be performed for the standard part models, a simulation of at least one kind of working from among assembling working, disassembling working, adjustment working and maintenance working for the standard part models is performed (Fig. 6.6; Page 122, Section 6.2.3).

8.12 As per Claim 15, **Siddique, Goto et al.** and **Hirai et al.** teach the simulation method of Claim 13. **Siddique** also teaches that where a tool is used to work the standard part models, the tool and a hand of a worker who uses the tool are used as the working means model to perform the simulation of the working (Page 117- Page120, Para 2).

8.13 As per Claim 16, **Siddique, Goto et al.** and **Hirai et al.** teach the simulation method of Claim 13. **Siddique** also teaches that where the standard part models are to be worked by a hand of a worker itself, the hand of the worker is used as the working means model to perform the simulation of the working (Page 142, Fig. 7.6, Items 4, 5, 9, 10, 11, 12 etc.).

8.14 As per Claim 17, **Siddique, Goto et al.** and **Hirai et al.** teach the simulation method of Claim 15. **Siddique** also teaches that when the process of execution of the simulation of the working is displayed in the virtual three-dimensional space, the working means model is

displayed in a shape suitable for an object of use in the virtual three-dimensional space (Page 122, Fig. 6.6 and Sec 6.2.3).

8.15 As per Claim 18, **Siddique, Goto et al.** and **Hirai et al.** teach the simulation method of Claim 16. **Siddique** also teaches that when the process of execution of the simulation of the working is displayed in the virtual three-dimensional space, the working means model is displayed in a shape suitable for an object of use in the virtual three-dimensional space (Page 122, Fig. 6.6 and Sec 6.2.3).

8.16 As per Claim 21, **Siddique, Goto et al.** and **Hirai et al.** teach the simulation method of Claim 13. **Siddique** also teaches that when interference occurs with the working means model in a process of execution of the working to be performed for the standard part models with the working means model, an occurrence condition of the interference is displayed (Page 123-125, Sec 6.2.4 and Fig. 6.7).

8.17 As per Claim 22, **Siddique** teaches a computer-readable recording medium having a simulation program recorded thereon for causing, in order to cause a computer to execute, based on design information of a design model designed in a virtual three-dimensional space, a simulation of working with a working means model used to work for the standard part models arranged in the design model (Fig. 6.6; Page 122, Sec. 6.2.3); the computer to implement:

a function of providing working means model information, which indicates details of a working means model to be used in working on the one or more standard part models (Page 117-Page120, Para 2);

the working means model information being linked with standard part model information (Page 128, Fig. 6.9);

a function of automatically acquiring the working means model information, which is to be linked with the working means model to be used in working on the individual standard part models used upon designing of a design model (Page 128, Fig. 6.9; Page 130, Fig. 6.11); and

a function of executing a simulation of working to be performed for the standard part models based on the acquired information of the working means model and a function of displaying a process of the execution of the simulation in a virtual three-dimensional space (Fig. 6.6; Page 122, Sec. 6.2.3).

Siddique does not expressly teach one or more standard part models are arranged in the design model and a function of providing standard part model information, which indicates details of the one or more standard part models. **Goto et al.** teaches one or more standard part models are arranged in the design model and a function of providing standard part model information, which indicates details of the one or more standard part models (Fig.2; Fig. 14; Col 4, Lines 24-28 and Col 4, Lines 37-49), as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus (Col 1, Lines 11-15). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the computer-readable recording medium having a simulation program recorded thereon of **Siddique** with the computer-readable recording medium having a simulation

program recorded thereon of **Goto et al.** that provided for one or more standard part models arranged in the design model and a function of providing standard part model information, which indicates details of the one or more standard part models, as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus.

Siddique teaches plural working means models preassociated with the standard part models based on the simulation that it satisfies a working condition of the working means model (Page 117, Para 2, Lines 6-10; Page 118, Sec. 6.2.2; Page 119, Para 1; Fig. 6.6; Page 122, Sec. 6.2.3). **Siddique** does not expressly teach that the working means model is automatically selected from among plural other working means models preassociated with the standard part models based on an automatic determination during the simulation that it satisfies a working condition of the working means model. **Hirai et al.** teaches that the working means model (tool) is automatically selected from among plural other working means models (tools) preassociated with the standard part models (specific component) based on an automatic determination during the simulation that it satisfies a working condition (cutting conditions) of the working means model (Abstract, Lines1-9; Col 4, Lines 44-50; Col 5, Lines 44-60; Col 52, Lines 35-37 and 65-67; Col 53, Lines 1-3), as that would allow selecting tools taking into account various factors; for machining operations these would be material to be removed, machining accuracy and machining (Col 1, Lines 19-20). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Siddique** with the method of **Hirai et al.** that included the working means model being automatically selected from among plural other working means models preassociated with the standard part

models based on an automatic determination during the simulation that it satisfies a working condition of the working means model, as that would allow selecting tools taking into account various factors; for machining operations these would be material to be removed, machining accuracy and machining.

8.18 As per Claim 23, **Siddique** teaches designing supporting apparatus, comprising

the designing supporting section including an attribute information extraction section for referring to the standard part model information storage section to automatically extract attribute information of a working means model to be used to work the standard part models arranged in the subject designed in the virtual three-dimensional space (Page 128, Fig. 6.9; Page 130, Fig. 6.11);

a design data outputting section for outputting data regarding the subject designed in the virtual three-dimensional space and data regarding the attribute information extracted by the attribute information extraction section as design data (Page 128, Fig. 6.9); and

the attribute information including working means model information, which indicates details of a working means model to be used in working on the one or more standard part models and which is linked with the standard part model information (Page 128, Fig. 6.9; Page 130, Fig. 6.11).

Siddique does not expressly teach a standard part model information storage section for storing standard part model information regarding one or more standard part models standardized in advance based on a predetermined specification model; and a designing supporting section for arranging one or more standard part models to perform supporting for designing a subject in a

virtual three-dimensional space. **Goto et al.** teaches a standard part model information storage section for storing standard part model information regarding one or more standard part models standardized in advance based on a predetermined specification model (Fig.3A; Col 4, Lines 23-50 and Col 5, Lines 19-22); and a designing supporting section for arranging one or more standard part models to perform supporting for designing a subject in a virtual three-dimensional space (Col 1, Lines 10-13), as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus (Col 1, Lines 11-15). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the designing supporting apparatus of **Siddique** with the designing supporting apparatus of **Goto et al.** that included a standard part model information storage section for storing standard part model information regarding one or more standard part models standardized in advance based on a predetermined specification model; and a designing supporting section for arranging one or more standard part models to perform supporting for designing a subject in a virtual three-dimensional space, as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus.

Siddique teaches plural working means models preassociated with the standard part models based on the simulation that it satisfies a working condition of the working means model (Page 117, Para 2, Lines 6-10; Page 118, Sec. 6.2.2; Page 119, Para 1; Fig. 6.6; Page 122, Sec. 6.2.3). **Siddique** does not expressly teach that the working means model is automatically selected from among plural other working means models preassociated with the standard part models based on an automatic determination during the simulation that it satisfies a working condition of the working means model. **Hirai et al.** teaches that the working means model

(tool) is automatically selected from among plural other working means models (tools) preassociated with the standard part models (specific component) based on an automatic determination during the simulation that it satisfies a working condition (cutting conditions) of the working means model (Abstract, Lines1-9; Col 4, Lines 44-50; Col 5, Lines 44-60; Col 52, Lines 35-37 and 65-67; Col 53, Lines 1-3), as that would allow selecting tools taking into account various factors; for machining operations these would be material to be removed, machining accuracy and machining (Col 1, Lines 19-20). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Siddique** with the method of **Hirai et al.** that included the working means model being automatically selected from among plural other working means models preassociated with the standard part models based on an automatic determination during the simulation that it satisfies a working condition of the working means model, as that would allow selecting tools taking into account various factors; for machining operations these would be material to be removed, machining accuracy and machining.

8.19 As per Claim 24, **Siddique** teaches an apparatus for simulating work upon a model, comprising:

a working means model, separate from the design model, of a type generally capable of mating with the standard part model, and having working requirements information for working the standard part model in a virtual three-dimensional space when mated with the standard part model (Page 117- Page120, Para 2);

arrangement information describing an arrangement of the working means model when it is arranged to be mated with the standard part model (Page 128, Fig. 6.9; Page 130, Fig. 6.11); and

a processing unit automatically determining whether or an extent to which the arranged working model can work the component model according to the arrangement information, the working requirements of the working means model and according to the design model (Fig. 6.6; Page 122, Sec. 6.2.3).

Siddique does not expressly teach a design model comprised of a standard part model. **Goto et al.** teaches a design model comprised of a standard part model (Fig.3A; Col 4, Lines 23-50 and Col 5, Lines 19-22), as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus (Col 1, Lines 11-15). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the apparatus of **Siddique** with the apparatus of **Goto et al.** that included a design model comprised of a standard part model, as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus.

Siddique teaches plural working means models preassociated with the standard part models based on the simulation that it satisfies a working condition of the working means model (Page 117, Para 2, Lines 6-10; Page 118, Sec. 6.2.2; Page 119, Para 1; Fig. 6.6; Page 122, Sec. 6.2.3). **Siddique** does not expressly teach that the working means model is automatically selected from among plural other working means models preassociated with the standard part models based on an automatic determination during the simulation that it satisfies a working condition of the working means model. **Hirai et al.** teaches that the working means model

(tool) is automatically selected from among plural other working means models (tools) preassociated with the standard part models (specific component) based on an automatic determination during the simulation that it satisfies a working condition (cutting conditions) of the working means model (Abstract, Lines1-9; Col 4, Lines 44-50; Col 5, Lines 44-60; Col 52, Lines 35-37 and 65-67; Col 53, Lines 1-3), as that would allow selecting tools taking into account various factors; for machining operations these would be material to be removed, machining accuracy and machining (Col 1, Lines 19-20). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Siddique** with the method of **Hirai et al.** that included the working means model being automatically selected from among plural other working means models preassociated with the standard part models based on an automatic determination during the simulation that it satisfies a working condition of the working means model, as that would allow selecting tools taking into account various factors; for machining operations these would be material to be removed, machining accuracy and machining.

8.20 As per Claim 27, **Siddique** teaches a method for simulating, comprising:

arranging a working means model into a working arrangement (Page 128, Fig. 6.9; Page 130, Fig. 6.11); and

automatically determining whether or an extent to which the working means model, as arranged in its working arrangement, can work, in virtual three-dimensional space, the standard part model, by using the design model and working requirements of the working means model to

automatically simulate the working means model working the standard part model (Fig. 6.6; Page 122, Sec. 6.2.3).

Siddique does not expressly teach an arrangement of a standard part model that is part of a design model. **Goto et al.** teaches an arrangement of a standard part model that is part of a design model (Fig.3A; Col 4, Lines 23-50 and Col 5, Lines 19-22), as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus (Col 1, Lines 11-15). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Siddique** with the method of **Goto et al.** that included an arrangement of a standard part model that is part of a design model, as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus.

Siddique teaches based on the automatic simulating, automatically determining whether, the working means model can work the standard part model as arranged in the design model (Page 117, Para 2, Lines 6-10; Page 118, Sec. 6.2.2; Page 119, Para 1; Fig. 6.6; Page 122, Sec. 6.2.3). **Siddique** does not expressly teach based on the automatic simulating, automatically determining whether, among plural working means models mate-able with the standard part model, the working means model can work the standard part model as arranged in the design model. **Hirai et al.** teaches based on the automatic simulating, automatically determining whether, among plural working means models (tools) mate-able with the standard part model, (workpiece) the working means model (tool) can work the standard part model as arranged in the design model (Abstract, Lines1-9; Col 4, Lines 44-50; Col 5, Lines 44-60; Col 52, Lines 35-37 and 65-67; Col 53, Lines 1-3), as that would allow selecting tools taking into account various

factors; for machining operations these would be material to be removed, machining accuracy and machining (Col 1, Lines 19-20). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Siddique** with the method of **Hirai et al.** that included based on the automatic simulating, automatically determining whether, among plural working means models mate-able with the standard part model, the working means model can work the standard part model as arranged in the design model, as that would allow selecting tools taking into account various factors; for machining operations these would be material to be removed, machining accuracy and machining.

8.21 As per Claim 29, **Siddique, Goto et al.** and **Hirai et al.** teach the apparatus of Claim 1. **Siddique** teaches simulating a working of the particular standard part model by two or more particular working means models, where the simulating is done with reference to an ideal working condition of each particular working means model (Page 117, Para 2, Lines 6-10; Page 118, Sec. 6.2.2; Page 119, Para 1; Fig. 6.6; Page 122, Sec. 6.2.3).

Siddique does not expressly teach the automatic determination is made, for a particular standard part model, where the particular working means models are automatically selected based on their pre-association with the particular standard part model. **Hirai et al.** teaches the automatic determination is made, for a particular standard part model (workpiece), where the particular working means models (tools) are automatically selected based on their pre-association with the particular standard part model (Abstract, Lines1-9; Col 4, Lines 44-50; Col 5, Lines 44-60; Col 52, Lines 35-37 and 65-67; Col 53, Lines 1-3), as that would allow selecting tools taking into account various factors; for machining operations these would be material to be

removed, machining accuracy and machining (Col 1, Lines 19-20). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Siddique** with the method of **Hirai et al.** that included the automatic determination being made, for a particular standard part model, where the particular working means models would be automatically selected based on their pre-association with the particular standard part model, as that would allow selecting tools taking into account various factors; for machining operations these would be material to be removed, machining accuracy and machining.

9. Claims 6, 19, 20, 25 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Siddque** (Thesis for Master of Science, submitted to Georgia Tech, 1995) in view of **Goto et al.** (U.S. Patent 5,075,866), and further in view of **Hirai et al.** (U.S. Patent 5,815,400) and **Hirata et al.** (U.S. Patent 6,157,902).

9.1 As per Claim 6, **Siddique, Goto et al.** and **Hirai et al.** teach the simulation apparatus of Claim 5. **Siddque** also teaches that that the interference checking section checks interference of the working means model when the standard part model arranged in the design model is worked using the working means model (Page 123, Sec. 6.2.4; Page 124, Fig. 6.7 and Para 2).

Siddque does not expressly teach that the interference checking section checks interference of the working means model including a route along which the working means model arrives at one of the standard part models when the standard part model arranged in the design model is worked using the working means model. **Hirata et al.** teaches that that the interference checking section checks interference of a part in disassembly/assembly and

remaining parts including a route along which the part arrives at other parts (Col 1, Lines 10-21; Col 2, Lines 23-36), as that would provide an automatic assembly/disassembly route producing system capable of simulating whether a designed product can actually be assembled or disassembled without actually manufacturing the product (Col 1, Lines 42-45). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the simulation apparatus of **Siddque** with the simulation apparatus of **Hirata et al.** that included the interference checking section checking interference of a part in disassembly/assembly and remaining parts including a route along which the part arrives at other parts, and substituting for the part the working means model and for other part the standard part model, as that would provide an automatic assembly/disassembly route producing system capable of simulating whether a designed product can actually be assembled or disassembled without actually manufacturing the product.

9.2 As per Claim 19, **Siddique, Goto et al.** and **Hirai et al.** teach the simulation method of Claim 13. **Siddque** teaches that a manner of working performed based on a condition defined in advance for the working means model is displayed as the process of execution of the simulation of the working (Page 120, Para 2 & 3; Fig 6.6).

Siddque does not expressly teach that a process through which the working means model arrives at one of the standard part models which provides a subject position is displayed as the process of execution of the simulation of the working. **Hirata et al.** teaches that a process through which the working means model arrives at one of the standard part models which provides a subject position is displayed as the process of execution of the simulation of the

working (Col 1, Lines 10-17; Col 2 Lines 53-56; Col 13, Line 64 to Col 14, Line 4 and Col 16, Line 3-7), as that would provide an automatic assembly/disassembly route producing system capable of simulating whether a designed product can actually be assembled or disassembled without actually manufacturing the product (Col 1, Lines 42-45). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the simulation method of **Siddque** with the simulation method of **Hirata et al.** that provided for a process through which the working means model arrived at one of the standard part models which provided a subject position being displayed as the process of execution of the simulation of the working, as that would provide an automatic assembly/disassembly route producing system capable of simulating whether a designed product could actually be assembled or disassembled without actually manufacturing the product.

9.3 As per Claim 20, **Siddique, Goto et al., Hirai et al.** and **Hirata et al.** teach the simulation method of Claim 19. **Siddique** does not expressly teach that after the working performed based on the condition defined in advance for the working means model is completed, a process through which the working means model is spaced away from the subject position based on a condition defined in advance for the standard part models is displayed. **Hirata et al.** teaches that after the working performed based on the condition defined in advance for the working means model is completed, a process through which the working means model is spaced away from the subject position based on a condition defined in advance for the standard part models is displayed (Col 2, Lines 61-67; Col 16, Line 3-7), because as per **Siddique**, from the simulation, the accessibility and relative difficulty of unfastening (fastening) can be determined

by the designer (Page 123, Para 1). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the simulation method of **Siddique** with the simulation method of **Hirata et al.** that provided for after the working performed based on the condition defined in advance for the working means model was completed, a process through which the working means model was spaced away from the subject position based on a condition defined in advance for the standard part models was displayed, as from the simulation, the accessibility and relative difficulty of unfastening (fastening) could be determined by the designer.

Siddique does not expressly teach that after the working means model is spaced by a predefined distance away from the subject position, the display of the working means model or the working means model and the standard part models is erased. **Hirata et al.** teaches that after the working means model is spaced by a predefined distance away from the subject position, the display of the working means model or the working means model and the standard part models is erased (Col 2, Lines 61-67; Col 16, Line 3-7), because as per **Siddique**, from the simulation, the accessibility and relative difficulty of unfastening (fastening) can be determined by the designer (Page 123, Para 1). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the simulation method of **Siddique** with the simulation method of **Hirata et al.** that provided for after the working means model was spaced by a predefined distance away from the subject position, the display of the working means model or the working means model and the standard part models was erased, as from the simulation, the accessibility and relative difficulty of unfastening (fastening) could be determined by the designer.

9.4 As per Claim 25, **Siddique, Goto et al.** and **Hirai et al.** teach the apparatus of Claim 24. **Siddique** does not expressly teach that the processing unit also automatically determines whether the working means model can be routed through the virtual three-dimensional space to its mated arrangement without interference between the moving working means model and the design model. **Hirata et al.** teaches that the processing unit also automatically determines whether the working means model can be routed through the virtual three-dimensional space to its mated arrangement without interference between the moving working means model and the design model (Col 1, Lines 10-21; Col 2, Lines 23-36), as that would provide an automatic assembly/disassembly route producing system capable of simulating whether a designed product can actually be assembled or disassembled without actually manufacturing the product (Col 1, Lines 42-45). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the apparatus of **Siddique** with the apparatus of **Hirata et al.** that included the processing unit automatically determining whether the working means model could be routed through the virtual three-dimensional space to its mated arrangement without interference between the moving working means model and the design model, as that would provide an automatic assembly/disassembly route producing system capable of simulating whether a designed product could actually be assembled or disassembled without actually manufacturing the product.

9.5 As per Claim 28, **Siddique, Goto et al.** and **Hirai et al.** teach the method of Claim 27. **Siddique** does not expressly teach determining whether a route of movement of the working means model to the arrangement with the standard part model can be performed without

interference between the main model and the working means model. **Hirata et al.** teaches determining whether a route of movement of the working means model to the arrangement with the standard part model can be performed without interference between the main model and the working means model (Col 1, Lines 10-21; Col 2, Lines 23-36), as that would provide an automatic assembly/disassembly route producing system capable of simulating whether a designed product can actually be assembled or disassembled without actually manufacturing the product (Col 1, Lines 42-45). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **Siddique** with the method of **Hirata et al.** that included determining whether a route of movement of the working means model to the arrangement with the standard part model can be performed without interference between the main model and the working means model, as that would provide an automatic assembly/disassembly route producing system capable of simulating whether a designed product could actually be assembled or disassembled without actually manufacturing the product.

10. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Siddque** (Thesis for Master of Science, submitted to Georgia Tech, 1995) in view of **Goto et al.** (U.S. Patent 5,075,866), and further in view of **Vold et al.** (U.S. Patent 4,975,856).

10.1 As per Claim 10, **Siddique** teaches a simulation apparatus for simulating based on design information of a design model designed in a virtual three-dimensional space (Fig. 6.6; Page 122, Sec. 6.2.3);

working for the standard part models arranged in the design model (Fig. 6.6; Page 122, Sec. 6.2.3); comprising:

a working means model information storage section for storing working means model information which indicates details of the working means model to be used in working on the one or more standard part models (Page 117- Page120, Para 2); the working means model information being linked with standard part model information which indicates details of the one or more standard part models (Page 128, Fig. 6.9);

a working means model information extraction section for automatically referring, based on information regarding the standard part models arranged in a design model, to the working means model information storage section to extract information regarding a working means model to be used to work the standard part models arranged in the design model (Page 128, Fig. 6.9; Page 130, Fig. 6.11);

a working simulation execution section for executing a simulation of the working of the standard part models with the working means model based on design information of the design model and the information regarding the working means model extracted by the working means model information extraction section (Fig. 6.6; Page 122, Sec. 6.2.3);

the information regarding the working means model stored in the working means model information storage section includes reference position information of the working means model when the working means model works the standard part models (Page 117, Para 2; Page 118, Para 2; Page 119 and 120);

the working simulation execution section performs a simulation of a relationship in position/posture of the working means model to the standard part models based on the reference

position information of the working means model and the standard part models (Fig. 6.6; Page 122, Sec. 6.2.3); and

the working simulation execution section executes a working simulation according to the plurality of operation methods(Fig. 6.6; Page 122, Sec. 6.2.3).

Siddique does not expressly teach that one or more standard part models standardized in advance based on a specification model are arranged in the design model. **Goto et al.** teaches that one or more standard part models standardized in advance based on a specification model are arranged in the design model (Fig.2; Fig. 14; Col 4, Lines 24-28; and Col 4, Lines 37-49), as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus (Col 1, Lines 11-15). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the simulation apparatus of **Siddique** with the CAD automatic design apparatus of **Goto et al.** that included one or more standard part models standardized in advance based on a specification model arranged in the design model, as standard parts were commercially available and widely used and their models were readily available in the CAD automatic design apparatus.

Siddique does not expressly teach that the design information of the design model includes reference position information of the standard part models when the working means model works the standard part models. **Goto et al.** teaches that the design information of the design model includes reference position information of the standard part models when the working means model works the standard part models (Fig. 16D, S144; Col 5, Lines 17-27; Col 5, Lines 29-32; Col 5, Lines 34-36), as the linkage model contains the relationship between the design model and the standard parts (Col 5, Lines 19-27). It would have been obvious to one of

ordinary skill in the art at the time of Applicant's invention to modify the simulation apparatus of **Siddique** with the simulation apparatus of **Goto et al.** that included the design information of the design model including reference position information of the standard part models when the working means model works the standard part models, as the linkage model would contain the relationship between the design model and the standard parts.

Siddique does not expressly teach that the working means model information storage section stores information of a plurality of reference positions for any working means model which allows operation thereof in a plurality of different methods. **Vold et al.** teaches that the working means model information storage section stores information of a plurality of reference positions for any working means model which allows operation thereof in a plurality of different methods (Col 20, Lines 4-19), as that allows improved responsiveness of operation and smoothness of motion, enabling greater tool path speed and accuracy of movement (Col 7, Lines 63-65). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the simulation apparatus of **Siddique** with the simulation apparatus of **Vold et al.** that included the working means model information storage section storing information of a plurality of reference positions for any working means model which allowed operation thereof in a plurality of different methods, as that would allow improved responsiveness of operation and smoothness of motion, enabling greater tool path speed and accuracy of movement.

10.2 As per Claim 11, **Siddique** teaches a simulation apparatus for simulating based on design information of a design model designed in a virtual three-dimensional space (Fig. 6.6; Page 122, Sec. 6.2.3);

working for the standard part models arranged in the design model (Fig. 6.6; Page 122, Sec. 6.2.3); comprising:

a working means model information storage section for storing working means model information which indicates details of the working means model to be used in working on the one or more standard part models (Page 117- Page120, Para 2); the working means model information being linked with standard part model information which indicates details of the one or more standard part models (Page 128, Fig. 6.9);

a working means model information extraction section for automatically referring, based on information regarding the standard part models arranged in a design model, to the working means model information storage section to extract information regarding a working means model to be used to work the standard part models arranged in the design model (Page 128, Fig. 6.9; Page 130, Fig. 6.11);

a working simulation execution section for executing a simulation of the working of the standard part models with the working means model based on design information of the design model and the information regarding the working means model extracted by the working means model information extraction section (Fig. 6.6; Page 122, Sec. 6.2.3);

the information regarding the working means model stored in the working means model information storage section includes reference position information of the working means model when the working means model works the standard part models (Page 117, Para 2; Page 118, Para 2; Page 119 and 120);

the information regarding the standard part models arranged in the design model include attribute information of the working means model related to the standard part models, and the

working means model information extraction section refers to the working means model information storage section based on the attribute information to extract the information regarding the working means model (Page 128, Fig. 6.9; Page 130, Fig. 6.11);

a workability evaluation section for evaluating workability based on a result of execution of the working simulation by the working simulation execution section and also based on information of the attribute of the working means model, where the workability indicates whether or an extent to which the working means model is able to work the one or more standard part models (Page 122, Section 6.2.3);

the working simulation execution section executes a working simulation according to the plurality of operation methods(Fig. 6.6; Page 122, Sec. 6.2.3); and

while evaluating a workability for each of the operation methods of the working means model, and the workability evaluation section evaluates the workability of the working means model for each of the working methods based on a result of execution of the working simulation according to the working method and also based on the information of the attribute, where the workability indicates whether or an extent to which the working means model is able to work the one or more standard part models (Page 122, Section 6.2.3).

Siddique does not expressly teach that one or more standard part models standardized in advance based on a specification model are arranged in the design model. **Goto et al.** teaches that one or more standard part models standardized in advance based on a specification model are arranged in the design model (Fig.2; Fig. 14; Col 4, Lines 24-28; and Col 4, Lines 37-49), as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus (Col 1, Lines 11-15). It would have been obvious to one

of ordinary skill in the art at the time of Applicant's invention to modify the simulation apparatus of **Siddique** with the CAD automatic design apparatus of **Goto et al.** that included one or more standard part models standardized in advance based on a specification model arranged in the design model, as standard parts were commercially available and widely used and their models were readily available in the CAD automatic design apparatus.

Siddique does not expressly teach that the working means model information storage section stores information of a plurality of reference positions for any working means model which allows operation thereof in a plurality of different methods. **Vold et al.** teaches that the working means model information storage section stores information of a plurality of reference positions for any working means model which allows operation thereof in a plurality of different methods (Col 20, Lines 4-19), as that allows improved responsiveness of operation and smoothness of motion, enabling greater tool path speed and accuracy of movement (Col 7, Lines 63-65). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the simulation apparatus of **Siddique** with the simulation apparatus of **Vold et al.** that included the working means model information storage section storing information of a plurality of reference positions for any working means model which allowed operation thereof in a plurality of different methods, as that would allow improved responsiveness of operation and smoothness of motion, enabling greater tool path speed and accuracy of movement.

11. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Siddque** (Thesis for Master of Science, submitted to Georgia Tech, 1995) in view of **Goto et al.** (U.S. Patent

5,075,866), and further in view of **Hirata et al.** (U.S. Patent 6,157,902) and **Gupta et al.** (U.S. Patent 6,233,538).

11.1 As per Claim 26, **Siddique** teaches an apparatus for simulating work upon a model, comprising:

a working means model, separate from the design model, of a type generally capable of mating with the standard part model, and having working requirements information for working the standard part model in a virtual three-dimensional space when mated with the standard part model (Page 117- Page120, Para 2);

arrangement information describing an arrangement of the working means model when it is arranged to be mated with the standard part model (Page 128, Fig. 6.9; Page 130, Fig. 6.11); and

a processing unit automatically determining whether or an extent to which the arranged working means model can work the component model according to the arrangement information, the working requirements of the working means model and according to the design model (Fig. 6.6; Page 122, Sec. 6.2.3).

Siddique does not expressly teach a design model comprised of a standard part model. **Goto et al.** teaches a design model comprised of a standard part model (Fig.3A; Col 4, Lines 23-50 and Col 5, Lines 19-22), as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus (Col 1, Lines 11-15). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the apparatus of **Siddique** with the apparatus of **Goto et al.** that included a design

model comprised of a standard part model, as standard parts are commercially available and widely used and their models are readily available in the CAD automatic design apparatus.

Siddique does not expressly teach that the processing unit also automatically determines whether the working means model can be routed through the virtual three-dimensional space to its mated arrangement without interference between the moving working means model and the design model. **Hirata et al.** teaches that the processing unit also automatically determines whether the working means model can be routed through the virtual three-dimensional space to its mated arrangement without interference between the moving working means model and the design model (Col 1, Lines 10-21; Col 2, Lines 23-36), as that would provide an automatic assembly/disassembly route producing system capable of simulating whether a designed product can actually be assembled or disassembled without actually manufacturing the product (Col 1, Lines 42-45). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the apparatus of **Siddique** with the apparatus of **Hirata et al.** that included the processing unit automatically determining whether the working means model could be routed through the virtual three-dimensional space to its mated arrangement without interference between the moving working means model and the design model, as that would provide an automatic assembly/disassembly route producing system capable of simulating whether a designed product could actually be assembled or disassembled without actually manufacturing the product.

Siddique does not expressly teach that orientation information is associated with the standard part model, and determining whether the working means model can be routed in the virtual three-dimensional space to its mated arrangement further comprises automatically

determining whether the working means model can approach the mating with the standard part model according to the orientation information and without interference from the main model. **Gupta et al.** teaches that orientation information is associated with the standard part model, and determining whether the working means model can be routed in the virtual three-dimensional space to its mated arrangement further comprises automatically determining whether the working means model can approach the mating with the standard part model according to the orientation information and without interference from the main model (Col 16, Lines 28-37; Col 17, Lines 1-14; Col 17, Lines 48-53; Col 21, Lines 31-36; Col 25, Lines 21-26), because many times the workpiece geometry is such that only one of the orientations will work without interfering with the components (Col 16, Lines 31-35); and there should be no unwarranted interference between the tooling and the workpiece during the operation, since such interference may distort the workpiece and damage the tools (Col 17, Lines 49-53). It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the apparatus of **Siddique** with the apparatus of **Gupta et al.** that included orientation information being associated with the standard part model, and determining whether the working means model could be routed in the virtual three-dimensional space to its mated arrangement further comprising automatically determining whether the working means model could approach the mating with the standard part model according to the orientation information and without interference from the main model, because many times the workpiece geometry would be such that only one of the orientations would work without interfering with the components; and there should be no unwarranted interference between the tooling and the workpiece during the operation, since such interference might distort the workpiece and damage the tools.

Arguments

12. As per the applicant's arguments, the applicant's attention is requested to the corresponding claim rejections. In addition, the following explanation is provided to further explain the examiner's position.

12.1 As per the Applicant's argument that "the 112 second paragraph rejection provides no explanation of why "ideal working condition" is vague and indefinite", the Examiner has withdrawn the 112 second and first paragraph rejections in response to the Applicant's amendments.

12.2 As per the applicant's argument that "**Siddique** does not discuss or suggest automatic selection of a working means model from among plural working means models, but rather discusses manual selection of a tool or working means model", the examiner has used a new reference **Hirai et al. Hirai et al.** teaches that the working means model (tool) is automatically selected from among plural other working means models (tools) preassociated with the standard part models (specific component) based on an automatic determination during the simulation that it satisfies a working condition (cutting conditions) of the working means model (Abstract, Lines1-9; Col 4, Lines 44-50; Col 5, Lines 44-60; Col 52, Lines 35-37 and 65-67; Col 53, Lines 1-3), as that would allow selecting tools taking into account various factors; for machining

operations these would be material to be removed, machining accuracy and machining (Col 1, Lines 19-20).

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 703-305-0043. The examiner can normally be reached on Monday through Friday from 8:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on (703) 305-9704. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9600.

K. Thangavelu
Art Unit 2123
July 10, 2004

KEVIN J. TESKA
SUPERVISORY
PATENT EXAMINER